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IN THIS ISSUE

THE DANGER OF WAR
AND OUR ABILITY TO FACE IT
—
CHURCHILL ON PEARL HARBOR
—
DEVELOPMENT OF THE BOMB;
PART 2 OF A SERIES

ATOMIC EXPLOSION

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THE ATOMIC BOMB

HOW WEAPON THAT LAUNCHED A NEW AGE WAS PRODUCED;
HERE IS WHAT AMERICANS CAN AND MUST KNOW ABOUT IT

This article, the second in LIFE's series on atomic energy, is the story of the bomb itself. Its purpose, like that of the first article, "The Atom" (LIFE, May 16, 1949), is to make public the information that Americans must have in order to think clearly in an atomic age. Necessary security and unnecessary secrecy obscure many aspects of the U.S.'s atomic weapons program, but enough have been officially released to give an over-all picture of this gigantic federal undertaking. This article reveals no secrets. It is based on published, unclassified material that can be found by anyone, including the Russians, in public libraries.

THERE is nothing that the average person needs to know about the atomic bomb which is too complicated to be understood or too secret to be stated. Two kinds of information are necessary: first, about the scientific basis of the bomb; second, about the way in which it is produced.

The most fundamental of the scientific facts, presented in LIFE's article "The Atom," are briefly these: all matter is composed of elements, the basic substances of the universe. Each element is made up of atoms of a particular kind which are structurally different from atoms of other elements. The atoms themselves consist of three kinds of particles: protons and neutrons, which form a nucleus; and electrons, which circle around it. The difference between the atoms of one element and those of another is in the number and arrangement of these particles. This structural difference is the basis of the master plan of matter, the modern periodic table.

This much was known 15 years ago. The physicists of 1935 understood the structure and properties of most kinds of atoms. They had discovered that the heaviest of them were unstable and could produce mild energy in the form of radioactivity. They also knew that there was a great binding force in the atomic nucleus which, if it could be released, would be a far greater source of energy. But no one knew how to release it. Then, in 1939, two German scientists discovered that a uranium atom could be made to split under the bombardment of a stream of neutrons and, in splitting, to release some of its nuclear energy. This splitting, or fission, was the process which was to make chain reaction and atomic explosions possible (next page). The German discovery was confirmed by scientists throughout the world. Within a few months experiments had progressed so far that on Aug. 2, 1939, Albert Einstein, acting as spokesman for the nuclear physicists, informed President Roosevelt that a uranium bomb could almost certainly be built in the immediate future. "A single bomb of this type," he wrote, "carried by boat and exploded in a port, might very well destroy the whole port together with some of the surrounding territory."

By 1943 the atomic project had progressed from laboratories

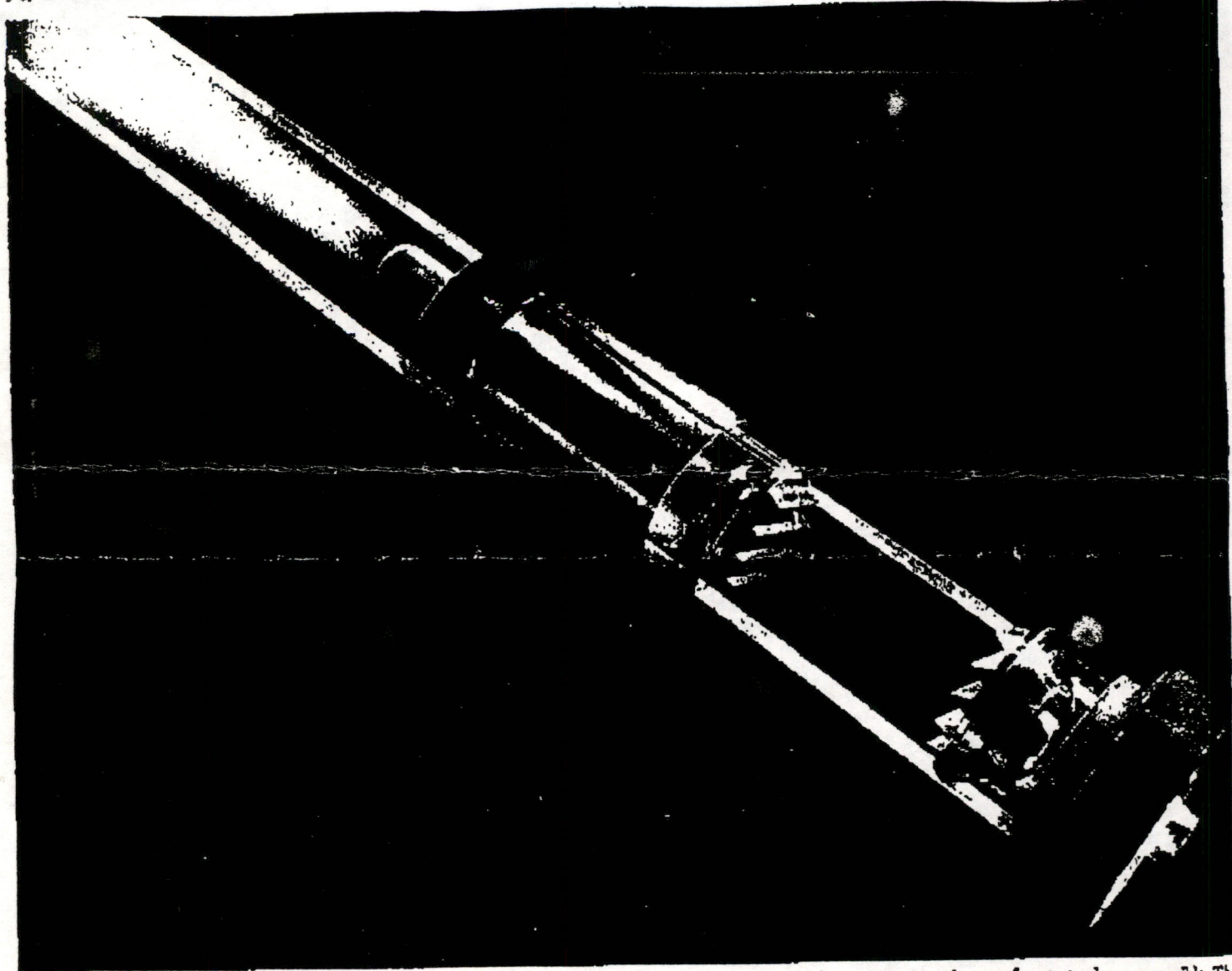
to pilot plants. A year later it was an immense industrial operation. The complicated problems of plant engineering were solved. The technology of large-scale bomb production was established. And the free discussion that had accompanied the original scientific research was cut off by the curtain of military secrecy which has veiled it ever since.

For the past five years the operations and results of the U.S. atomic weapons program have been almost completely unknown to the public. The critical facts about this greatest of all publicly owned enterprises have been withheld, partly because of essential security restriction. But a larger factor behind the present state of public ignorance is the extension of secrecy far beyond the limits of true security.

This growing disparity between required security and officially imposed secrecy has recently come in for sharp criticism by many of the country's best-informed observers. Joseph and Stewart Alsop, writing about the world strategic situation and the H-bomb, say, "what the President has said [about the bomb] is not one third, or one tenth, of what it is his bounden duty to say." Hanson Baldwin, in the New York Times, writes: "facts are the foundation of democracy—and facts we do not have." Physicist J. R. Oppenheimer, in a recent television interview, (pp. 37, 38), pointed out that wisdom and truth cannot flourish without the give-and-take of debate and criticism, and added that "the facts [about atomic energy] are of little use to an enemy, yet they are fundamental to an understanding of the issue of policy."

The extent of public information about atomic weapons must of course be limited. It cannot and should not include a knowledge of facts that could conceivably be of use to an enemy. It should, but—for reasons of specious security—does not at present include all the facts that are useless to an enemy or known to him. But despite these existing limitations, public information can and should be substantially increased. This can be done by culling the facts that have been officially released in documents like the famous *Smyth Report* and presenting them in an understandable form. That has been LIFE's procedure and purpose in the preparation of the article presented in the following pages.

← A MILLION TONS OF WATER, kicked out of Bikini lagoon by an atomic blast, spread a radioactive canopy over dwarfed forms of two battleships.



MODEL illustrates the basic principles of A-bomb design. Essentially the bomb works by bringing together about 30 pounds of U-235 or plutonium, the critical amount necessary to sustain a chain reaction. Once the material is assembled, the reaction immediately begins, started by spontaneous fissions which occur continually

in the metal. Since the components must be assembled extremely rapidly, a rocket or gun might be used to drive one against the other. A spherical form is probably used because its compact geometry allows fewer neutrons to escape, thus increasing the intensity of the reaction. The faces of the two hemispheres are milled in a toothlike

pattern to make area of contact as large as possible. The actual bomb mechanism is of course far more complicated. Engineered at Los Alamos (the closely guarded weapons research laboratory, whose operations cannot be described) and manufactured at the nearby Sandia plant, it is one of the nation's top military secrets.

IS BOMB NONE OF THE PEOPLE'S BUSINESS?

On Dec. 5, 1945 Physicist J. Robert Oppenheimer, wartime director of the Los Alamos laboratory, testified in Washington before the Senate's Special Committee on Atomic Energy. In the course of his testimony he was asked—and answered—the most crucial and far-reaching question that can be raised about the entire American atomic weapons program: At what rate does the U.S. produce atomic bombs?

"How long," asked Senator Millard Tydings, "would it take us to make 50 [bombs]?"

"Maybe nine months," replied Oppenheimer.

By simple arithmetic it is possible to deduce from this statement that the U.S. must by now have at least 500 bombs. This one comment, therefore, enables any layman who stops to think about it to determine the approximate size of his country's stockpile. Three hundred is almost certainly a minimum figure. Official reports have announced recent additions to the existing production plants

(early this year the AEC contracted for a \$100-million expansion program at Oak Ridge). But any intelligent person—as he citizen or spy—can obtain an even more accurate estimate of this ostensibly secret figure. For there are available in libraries throughout the country published and unclassified documents, many of them released by the government, which contain facts upon which such an estimate may be based.

It must be assumed that the approximate size of the U.S. stockpile of bombs is no secret. Nevertheless this information, so vitally necessary to the making of policy, is denied to the people who are finally responsible for determining what policy shall be: the citizens of the U.S. and their elected representatives.

There is no possible justification for this kind of overextended secrecy. Enlightened members of the federal government know this, and they have fought its growth. Two years ago David Lilien-

thal, then chairman of the Atomic Energy Commission, warned the American people of the harmful effects that such phony security might have: "There is a growing tendency in some quarters to act as if atomic energy were none of the people's business. . . . In my opinion this is plain nonsense and dangerous nonsense—dangerous to cherished American institutions and for that reason dangerous to genuine national security. . . . If schemers or fools or rascals or hysterical stuffed shirts get this thing out of [the people's] hands, it may then be too late to find out what it is all about."

The restriction of public knowledge Lilienthal feared is being brought about. So stifling are the effects of all-encompassing security that conscientious publications are unwilling to take the responsibility for presenting conclusions which the themselves could draw from the available, not secret literature. The government can and should take that responsibility—now, before it is too late.